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ABSTRACT

This digest reviews information in the science education literature on teaching about societal issues in science classes. Reasons for including a discussion of social issues in science classrooms are given, and instructional approaches for teaching about science and society are presented. Several Internet resources related to teaching about societal issues in science classes are also included. Contains 13 references. (WRM)

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Current reform movements in science education call for all students to be "scientifically literate." One aspect of literacy includes an understanding of the various roles of science in society, from both local and global perspectives. One way to examine the roles of science in society is through study of community issues, matters that evoke diverse viewpoints, present competing interpretatons of data, and offer choices among possible actions. On a global scale, consideration of societal issues can lead to questions such as:

- Is overpopulation a problem in this society? In the world?
- How do new diseases (like AIDS, Ebola, Hantavirus) emerge? How will we keep them under control?
- Do we have an obligation to "help" developing countries? How do we ensure the use of "culturally appropriate" technology?
- What does the mentality of a "throw-away society" mean for local ecology? Global ecology?
- Would a nuclear power plant be a wise investment for my community?
- How will work on the Human Genome Project affect our individual privacy or rights?

These are possible topics for today's science classrooms, but should teachers include them? How can this be done?

Including social issues in science classrooms

In summarizing the Project Synthesis report in 1981, Harms and Yager called for "a major redefinition and reformulation of the goals for science education...[taking] into account the fact that students today will soon be operating as adults in a society which is even more technologically-oriented than at present; they will be participating as citizens in important science-related societal decisions."

The National Science Teachers' Association followed up on this recommendation by issuing guidelines for school science classes that emphasize connections between science and society (1982, 1990). More recently, Project 2061's *Benchmarks for Science Literacy* (1993) and the *National Science Education Standards* (1996) each call for an approach to school science that includes discussion of the nature of the scientific enterprise and its interplay with local, national and global communities.

For traditional, discipline-based programs, these ideas represent a radical shift in thinking from the science-career preparation mode of school curricula that have dominated since the 1960s. But the idea of using social issues to facilitate learning and critical thinking in the classroom is not new to the environmental education or the science, technology, society (STS) curricular movements. Research and recommendations from these literatures will be important in reshaping more traditional science courses to correspond with reform efforts.

Yager and Lutz (1995) give some specific reasons for including societal issues in school science courses: (1) it justifies information included in science courses; (2) it allows students to find science classes relevant to their daily lives; (3) it enables teachers to evaluate student success at application and synthesis of ideas; (4) it redefines the teacher's role to be "facilitator," and relegates the textbook's status to "information source; (5) it may allow for increased scientific understanding of concepts, based on cognitive theories of learning; and (6) it provides a vehicle for tying the whole school program together.

Practicing scientists also recognize the importance of the interplay between science and society. For example, the Union of Concerned Scientists (UCS) has been working for nearly three decades to "advance responsible public policies in areas where science and technology play a critical role." In 1992, the UCS-sponsored "World Scientists' Warning to Humanity" was signed by some 1700 scientists, including a majority of Nobel laureates in science. Also, Hurd (1991) has pointed out that research in the sciences is increasingly focused on solving societal problems, and that recent philosophies of science knowledge stress its societal context.

Implementation

Given these compelling reasons to include discussion of societal issues in science classrooms, what are the best instructional approaches to take? This question becomes particularly important in light of a study by Mitchener and Anderson (1989) where findings indicated that some teachers may avoid covering science-related social issues because of concerns about teaching methods.

Aikenhead (1992) has developed a model of the interface between science, technology, and society that may help in the sequencing of instructional topics (see Figure 1). He attaches a ring of "technology" around a circle of "science content," and places this on a backdrop of "society." Imagining a vector passing through the diagram, we can follow his idea of sequence. The instruction could start with a discussion of the societal aspects of an issue, then cover technological aspects of the problem.

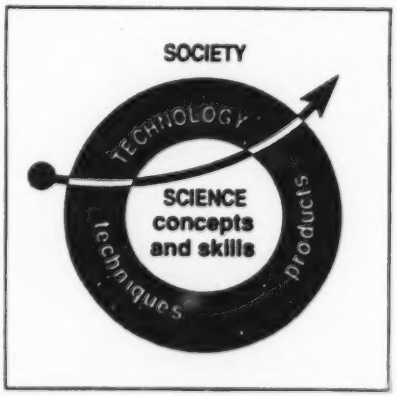

Figure 1. A schematic illustrating a possible sequence for organizing STS material (from Aikenhead, 1992)

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followed by science concept information. Once the science concepts are understood, the students reconsider the technological and societal issues, and attempt to make informed decisions or predictions about the issue. Or, the discussion could begin with technology or science, as long as it proceeds along the arrow in Aikenhead's diagram to end up in "society." The idea, in essence, is to start with a fundamentally interesting issue (either about society, technology, or science), and then always follow a discussion of science concepts with treatment of relevant topics in technology and society.

Heath (1992) has outlined several possible instructional techniques for science teachers to employ when study is centered around a social issue. He asserts that simulations, cooperative or collaborative action projects, debates, independent projects, small group discussions, case studies, surveys, oral presentations and written reports are all useful strategies for the classroom teacher. Others have described successful classroom treatment of societal issues which may serve as exemplars for practicing teachers: Ramsey and Kronholm (1991) have described the use of the extended case study (ECS) approach to teaching environmental issues in elementary school; Geddis (1991) has illustrated how a high school science teacher covered the acid rain controversy in his classroom; and Cross (1993) has shown how teachers may use risk assessment and analysis to help students confront complex societal issues.

Mitchener and Anderson's study also indicates that science teachers are uncertain about evaluation tools to use when covering social issues. Cheek (1992) has described the use of essay examinations, performance-based assessments, and portfolios as methods of assessment in STS units.

Finally, Heath points out that many teachers who have decided to teach about science and society would benefit from a support system (1992). He identifies electronic networks, multidisciplinary and multigrade teams within the school system, and partnerships with colleges or universities as important sources of professional development. Such support would allow teachers to share ideas about successful classroom strategies, and to uncover current information about issues and topics that may not be found in traditional science textbooks. Some World Wide Web sites that may be of help in examining societal issues are provided below.

The increasingly complex interplay between the scientific enterprise and modern society mandates classroom treatment of societal issues in contemporary science education. Perspectives and strategies that have been successful in the science, technology, and society curricular movement, as well as the environmental education movement, will prove to be invaluable resources for traditionally-trained science teachers who are beginning to delve into these topics.

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Internet Resources

Econet:
http://www.igc.org/igc/econet/index.html/

Issues in Science and Technology
http://www.utdallas.edu/research/issues/

SATISRUN
http://ourworld.compuserve.com:80/homepages/MJOvery/

Science Education Professional Organizations
http://science.coe.uwf.edu/

Science, Technology & Society Links
http://gpu2.srv.ualberta.ca/~slis/guides/scitech/kmc.htm/

Union of Concerned Scientists
http://www.ucsusa.org/

Where to Go for More Information

The ERIC database includes bibliographic information on over 2,00 items with *science and society* as an indexing term. This is the ERIC Descriptor used to index terms having to do with science, technology, and society, or STS. You can search the ERIC database on the World Wide Web at either of these locations: [*http://ericae2.educ.cua.edu/search.htm*] or [*http://ericir.syr.edu/*].

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